IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Trutna, Jr. et al.	)	
Serial No. 10/733,675	)	Group Art Unit: 2611
Filed: December 11, 2003	)	Confirmation No. 8969
For: COMMUNICATION SYSTEM USING WAVELENGTH SPREAD-SPECTRUM CODING	)	Examiner: AGHDAM, Freshteh

APPEAL BRIEF UNDER 37 C.F.R. §41.37

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January 29, 2009
Filed Electronically

Sir:

This Appeal Brief under 37 C.F.R. §41.37 is submitted in support of the Notice of Appeal filed December 31, 2008, appealing to the Board from the action of the Examiner's Final Office Action, mailed September 4, 2008, finally rejecting claims 1-6 and 11-19 of the above referenced application.

I hereby certify that this correspondence is being electronically transmitted via EFS Web to the United States Patent and Trademark Office on:

Date: January 29, 2009 /John M. Harman/
John M. Harman, Reg. No. 38,173

I. REAL PARTY IN INTEREST

The real party in interest of the instant application is Avago Technologies Fiber IP (Singapore) PTE. LTD, having a principal place of business in Fort Collins, Colorado.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF THE CLAIMS

Claims 1-6 and 11-19 are pending in the application. Claims 7-10 and 20-25 were withdrawn. Claims 1-6 and 11-19 stand finally rejected under 35 U.S.C. §103(a). The Appellants hereby appeal the final rejection of claims 1-6 and 11-19.

IV. STATUS OF THE AMENDMENTS

A Restriction Requirement was mailed January 26, 2007. The Appellants submitted a Response to the Restriction Requirement dated February 26, 2007, withdrawing claims 7-10 and 20-25. A non-final Office Action was mailed on March 23, 2007. The Appellants submitted a Response and Amendment dated June 25, 2007, amending claims 1 and 11, but not canceling any claims. A final Office Action was mailed August 21, 2007. The Appellants submitted a Request for Pre-Appeal Brief Conference and a Notice of Appeal dated November 20, 2007. A Notice of Panel Decision from Pre-Appeal Brief Review was mailed January 24, 2008, indicating that the final Office Action was withdrawn and a new Office Action will be mailed. A non-final Office Action was mailed on March 6, 2008. The Appellants submitted a Response

dated June 3, 2008, not amending or canceling any claims. A final Office Action was mailed September 4, 2008. The Appellants submitted a Response dated November 4, 2008, not amending or canceling any claims. An Advisory Action was mailed December 1, 2008, indicating that the remarks made in the Response dated November 4, 2008, would be entered. The Appellants submitted a Notice of Appeal on December 31, 2008.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The invention relates to wavelength division multiplexing (WDM) transmission of multiple information signals via multiple transmission channels. The transmission involves spread-spectrum encoding the multiple information signals, allocating the same spread code bits from each coded information signal to a respective transmission channel, and analog summing the allocated bits in each transmission channel to generate a modulation signal used to generate an optical transmission signal for each transmission channel. This WDM transmission, in which a part of each information signal is carried by every transmission channel and each transmission channel carries part of every information signal, allows the transmission system to transmit more full-bandwidth information signals than the number of transmission channels in the system.

The invention as set forth in independent claim 1 (and, by dependency, dependent claims 2-6) relates to a method (300) for transmitting a plurality of information signals via multiple transmission channels. Each information signal is encoded (301) with a respective spreading code to generate a coded signal corresponding to each bit of the spreading code. The coded signals corresponding to the same bit of the spreading codes are allocated (303) to a respective transmission

channel. Then, in each transmission channel, the coded signals allocated to the transmission channel are analog summed (305) to generate a modulation signal, which is used to modulate (307) an optical transmission signal in response to the modulation signal. The subject matter of claims 1-6 is illustrated at least in Fig. 11, and described in the specification at least in paragraph [0011] and paragraph [0100].

The invention as set forth in independent claim 11 (and, by dependency, dependent claims 12-19) relates to an apparatus (20) for transmitting a plurality of information signals via multiple transmission channels. The apparatus includes a spread-spectrum encoder (21-24) for each of the plurality of information signals, a signal allocator (25) and, in each transmission channel, an analog summer (36-39) and a transmitter. Each spread-spectrum encoder is operable to encode an information signal with a respective spreading code to provide a coded signal corresponding to each bit of the spreading code. The signal allocator is structured to allocate the coded signals corresponding to the same bit of the spreading codes to a respective one of the transmission channels. In each transmission channel, the analog summer receives coded signals allocated to the transmission channel from the signal allocator, and the transmitter includes a modulation input connected to the output of the analog summer for receiving a modulation signal generated from the analog summer. The subject matter of claims 12-19 is illustrated at least in Fig. 2, and described in the specification at least in paragraphs [0013] and paragraphs [0033] through [0043].

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

There are nine issues presented for review.

The first issue in this appeal is whether claims 1-2 are unpatentable under 35 U.S.C. §103(a) over Sudo (U.S. Patent No. 6,839,335), further in view of Dent (U.S. Patent No. 6,680,928) and Hoang et al. (U.S. Patent Publication No. 2004/0246973).

The second issue in this appeal is whether claim 3 is unpatentable under 35 U.S.C. §103(a) over Sudo, Dent and Hoang et al., and further in view of Shattil (U.S. Patent Publication No. 2002/0150070).

The third issue in this appeal is whether claims 4-5 are unpatentable under 35 U.S.C. §103(a) over Sudo, Dent and Hoang et al., and further in view of van der Gracht et al. (U.S. Patent No. 4,835,517).

The fourth issue in this appeal is whether claim 6 is unpatentable under 35 U.S.C. §103(a) over Sudo, Dent and Hoang et al., and further in view of Balachandran et al. (U.S. Patent No. 7,187,715).

The fifth issue in this appeal is whether claims 11-12 are unpatentable under 35 U.S.C. §103(a) over Sudo, further in view of Dent and Ahn et al. ("A Symmetric-Structure CDMA-PON System and Its Implementation," IEEE PHOTONICS TECHNOLOGY LETTERS, Vol. 14, No. 9, September 2002).

The sixth issue in this appeal is whether claim 13 is unpatentable under 35 U.S.C. §103(a) over Sudo, Dent and Ahn et al., and further in view of Shattil.

The seventh issue in this appeal is whether claims 14-16 are unpatentable under 35 U.S.C. §103(a) over Sudo, Dent and Ahn et al., and further in view of Way (U.S. Patent Publication No. 2002/0021464).

The eighth seventh issue in this appeal is whether claims 17-18 are unpatentable under 35 U.S.C. §103(a) over Sudo, Dent and Ahn et al., and further in view of van der Gracht et al.

The ninth issue in this appeal is whether claim 19 is unpatentable under 35 U.S.C. §103(a) over Sudo, Dent and Ahn et al., and further in view of Balachandran et al.

VII. ARGUMENT

A. Rejection of claims 1-2 under 35 U.S.C. §103(a) over Sudo, further in view of Dent and Hoang et al.

The proposed combination of references fails to disclose or suggest the Appellants' invention as recited in independent claim 1. More specifically, the spread transmission signal allocation process in Sudo is completely different from and not suggestive of the Appellants' claimed spread coded signal bit allocation method steps. Therefore, even the combination of Sudo with other references, e.g., Dent and Hoang et al., does not disclose or suggest the Appellants' claimed invention as recited in independent claim 1.

According to 35 U.S.C. §103(a), a patent may not be obtained if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. However, if the proposed modification to a prior art reference would render the invention disclosed in the reference unsatisfactory for its intended purpose, then there is no

suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). Also, if the proposed modification or combination of the prior art would change the principle of operation of the invention disclosed in the prior art reference, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959); MPEP 2143.01, page 2100-129.

The Appellants' claim 1 recites a "wavelength division multiplexing (WDM) method for transmitting information signals via multiple transmission channels." The claimed method includes a step of "encoding each information signal with a respective spreading code to generate a coded signal corresponding to each bit of the spreading code." The claimed method also includes a step of "allocating the coded signals corresponding to the same bit of the spreading codes to a respective one of the transmission channels." The claimed method further recites that, in each of the transmission channels, the coded signals allocated to the particular transmission channel are analog summed to generate a modulation signal, and an optical transmission signal is generated in response to the modulation signal.

The Sudo reference discloses a combination OFDM (orthogonal frequency-division multiplexing) and CDMA (code division multiple access) radio communication apparatus and method for decreasing amplitude differences between subcarrier signals to maintain orthogonality between spreading codes. The Examiner states that Sudo discloses the Appellants' encoding step, and cites Fig. 1, the spreading sections (1) and the spreading codes 1 through n, and the discussion at col. 1, lines 28-34 of Sudo as disclosing the Appellants' encoding step. Also, the Examiner states that Sudo discloses

the Appellants' allocating step, and cites Fig. 1 and the discussion at col. 1, lines 57-64 as disclosing the Appellants' allocating step. The Appellants note that col. 1, lines 57-64 of Sudo discuss the operation of the Inverse Fast Fourier Transform (IFFT) section (4), along with the immediately preceding paragraph (col. 1, lines 53-56).

As will be discussed in greater detail hereinbelow, in the Appellants' invention as recited in claim 1, the coded signals generated by the encoding step are allocated directly to one of the transmission channels. In Sudo, the spread transmission signals output from the spreading sections (1) pass through both an addition section (2) and a Serial-Parallel (S/P) converter (3) before being allocated, i.e., before being input to the IFFT section (4) for Inverse Fast Fourier Transform processing. The Examiner does not discuss either the addition section (2) or the S/P converter section (3), or the effect of their processes on the spread transmission signals passing therethrough before the resulting signals are input to the IFFT (allocation) section. The operation of the addition section and the S/P converter section are discussed in Sudo at col. 1, lines 46-52.

The Appellants respectfully note that Sudo is not allocating spread-spectrum encoded transmission signals in the same or similar manner as in the Appellants' claimed invention as recited in claim 1. More specifically, in Sudo, the intermediate processes occurring between what the Examiner states discloses the Appellants' encoding step and what the Examiner states discloses the Appellants' allocating step actually transform (by performing additional processes on) the spread-spectrum encoded transmission signals after such signals have been output from the spreading sections (1) and before such signals are input to the IFFT (allocation) section (4). Thus, different signal information is being allocated in Sudo than is being allocated in the

Appellants' claimed invention as recited in claim 1. Because of Sudo's additional processing, the transmission signals input to the IFFT section can not possibly be the same kind of transmission signals as the transmission signals allocated directly in the Appellants' claimed method. Accordingly, the respective allocation processes are different, at least in the sense that different information is being allocated in Sudo than is being allocated in the Appellants' claimed invention. As a result, regardless of any similarities or differences of any remaining transmission method steps, the signal transmission method in Sudo, even combined with the teachings of other references, can not disclose or even suggest the Appellants' claimed invention as recited in claim 1.

In the Appellants' independent claim 1, the encoding step recites "generating a coded signal corresponding to each bit of the spreading code," and the allocating step recites "allocating the coded signals corresponding to the same bit of the spreading codes to a respective one of the transmission channels." Furthermore, as shown in the Appellants' Fig. 2, and as described in the specification, e.g., at paragraph [0036], the signal allocator (allocating circuit 25), which performs the allocation step, has direct connections between the outputs of the spread-spectrum encoders 21-24, which perform the encoding step, and the inputs of the analog summers 36-39. Therefore, the "coded signals" generated by the encoding step are the same "coded signals" that are allocated by the allocating step. Accordingly, it is clear that the Appellants' claimed method does not have any additional processing sections or perform any additional processes on the coded signals generated by the encoding step before those coded signals are allocated by the allocating step.

By comparison, in Sudo, the addition section (2) and the S/P converter (3) are connected directly between the output of the spreading section (1) and the input of the IFFT (allocating) section (4). As discussed in Sudo, the addition section (2) adds the spread transmission signals output from the spreading section (1), and the serial-parallel converter (3) divides and disassembles the added spread signals into individual chips (bits) for each spread signal. See Sudo, at col. 1, lines 46-52. Sudo does not provide any additional discussion for these sections, although the S/P converter (3) appears to be a serializer that, in effect, interleaves the spreading codes that have been added together by the addition section (2). The interleaved signal information then is input to the IFFT processing section (4), where interleaved signal information is frequency division multiplexed. Thus, only after the spread transmission signals are subject to this additional processing by the addition section and the S/P converter section are the resulting signals input to the IFFT (allocating) section.

Clearly, in Sudo, the additional processing sections, i.e., the addition section (2) and the S/P converter section (3), and their respective additional processing, transform the spread-spectrum encoded transmission signals output from the spreading section (1), at least to the extent that the signal information input to the IFFT (allocating) section (4) is different than the signal information that was output from the spreading (encoding) section. Also, there is nothing in Sudo to suggest that the addition section (2) and the S/P converter section (3) are not necessary for proper operation of the transmission method cited in Sudo. Therefore, the removal of the addition section (2) and a Serial-Parallel (S/P) converter (3) in Sudo would change the principle of operation and almost certainly destroy the intended purpose of Sudo's transmission method. Thus, because

of the additional processing sections, Sudo does not disclose and is not suggestive of allocating the coded signals generated by the encoding step directly (i.e., without any additional signal processing or transformation) to a respective one of the transmission channels, as in the Appellants' claimed invention as recited in claim 1.

Additionally, with respect to allocation, the Appellants respectfully note that Sudo's IFFT (allocation) section, which is cited by the Examiner as teaching the Appellants' allocating step, performs Inverse Fast Fourier Transform processing on the information received thereby. The Appellants' allocating step (via the signal allocating circuit 25 shown in Fig. 2) performs no such processing (or any other type of processing) as part of its signal allocation to the analog summers. The Appellants' allocating circuit 25, as shown in Fig. 2, amounts to a combination of direct connections between the outputs of various spread spectrum encoders and the inputs of various transmission channel analog summers.

The Appellants' allocating step allocates the same bits of the spreading codes to a respective one of the transmission channels before summing the coded signals. For example, the first bits of a plurality of different encoded information signals are input to an analog summer of a first transmission channel, while the second bits of the plurality of different encoded information signals are input to an analog summer of a second transmission channel. By comparison, in Sudo, the spread signals added by the addition section (2), and divided and disassembled by the S/P converter section (3) into individual chips (bits) for each spread signal, are then allocated to a corresponding subcarrier (i.e., frequency division multiplexed) using the IFFT processing section (4). See the cited language in col. 1, lines 57-64 of Sudo.

However, regardless of any differences or similarities between Sudo's IFFT (allocation) section and the direct allocation of the Appellants' allocating circuit, there still remains the issue of the additional signal processing in Sudo that occurs between the spreading section encoding step and the IFFT section allocating step, compared to the Appellants' direct allocation of the coded signals generated by the encoding step to the analog summer in one of the transmission channels. That is, regardless of any allocation process, the signal transmission method in Sudo can not be suggestive of the Appellants' signal transmission method, at least because of the additional processing sections in Sudo and the additional processing performed on the encoded signals before they are input to the allocation section. Clearly, as discussed hereinabove, the additional processing sections and their respective processing steps cause the data signals input to the IFFT allocation section to be different than data signals that would be input directly from the encoding section to the allocation section.

Accordingly, for at least this reason, the combination of the cited language in Sudo with other references, e.g., Dent and Hoang et al., does not disclose or suggest the Appellants' claimed invention as recited in claim 1.

The Dent reference, which is cited for its disclosure of summing spread-spectrum coded signals, does not cure the deficiencies of Sudo in failing to disclose or suggest the Appellants' invention as recited in claim 1. The Examiner cited the combiner (24) in Fig. 1 and the combiner (58) in Fig. 2 as examples of summing spread-spectrum coded signals assigned or allocated to the same transmission channel. The Appellants note that the cited combiners in Dent each combine the entire spread-spectrum coded signal of a plurality of spread-spectrum coded signals to generate a single, composite

modulation signal. However, there is no suggestion in Dent of summing the same bits of each of a plurality of spreading code coded signals using a corresponding plurality of analog summers for each of the same bits from each of the plurality of spreading code coded signals to generate a corresponding plurality of modulation signals, as in the Appellants' invention as recited in claim 1. Regardless, the teachings of Dent do not cure the deficiencies of Sudo in failing to disclose or suggest the direct allocation in the Appellants' invention as recited in claim 1.

Similarly, the Hoang et al. reference, which is cited for disclosing that wavelength division multiplexing is a form of frequency division multiplexing and that carrier frequencies could be replaced by carrier wavelengths, is unrelated to the allocation differences between Sudo and the Appellants' claimed invention, e.g., as described hereinabove. As expected, the Hoang et al. reference does not disclose or suggest any cure to the deficiencies of Sudo (and Dent) in failing to disclose or suggest the Appellants' invention as recited in claim 1.

Therefore, the Appellants respectfully submit that independent claim 1 is allowable over Sudo in view of Dent and Hoang et al. Also, the Appellants respectfully submit that dependent claim 2, which depends directly from claim 1, is allowable at least because of its dependency from an allowable independent claim.

B. Rejection of claim 3 under 35 U.S.C. §103(a) over Sudo, Dent and Hoang et al., and further in view of Shattil.

As discussed previously herein, the Appellants' claimed invention as recited in claim 1 is neither disclosed in nor suggested by Sudo combined with Dent and Hoang et

al. Shattil, which is cited for its disclosure of the use of quasi-orthogonal spreading codes, does not cure the deficiencies of Sudo, Dent and Hoang et al. in failing to disclose or suggest the Appellants' invention as recited in claim 1. Accordingly, the Appellants respectfully submit that Shattil in combination with Sudo, Dent and Hoang et al. does not disclose or suggest the Appellants' invention as recited in claim 1.

Claim 3 depends directly from independent claim 1, and incorporates all of the features of claim 1. Furthermore, claim 3 includes other features that, when combined with the subject matter of claim 1, are neither shown in nor suggested by Sudo, Dent and Hoang et al., and further in view of Shattil. For at least these reasons, the Appellants respectfully submit that claim 3 is allowable over Sudo, Dent and Hoang et al., and further in view of Shattil.

C. Rejection of claims 4-5 under 35 U.S.C. §103(a) over Sudo, Dent and Hoang et al., and further in view of van der Gracht et al.

As discussed previously herein, the Appellants' claimed invention as recited in independent claim 1 is neither disclosed in nor suggested by Sudo in combination with Dent and Hoang et al. The van der Gracht et al. reference, which is cited for its disclosure of the use of data spreading using exclusive-NORing, does not cure the deficiencies of Sudo, Dent and Hoang et al. in failing to disclose or suggest the Appellants' invention as recited in claim 1. Accordingly, the Appellants respectfully submit that van der Gracht et al. in combination with Sudo, Dent and Hoang et al., does not disclose or suggest the Appellants' invention as recited in claim 1.

Claims 4 and 5 depend directly or indirectly from claim 1, and incorporate all of the features of claim 1. Furthermore, claims 4 and 5 include other features that, when combined with the subject matter of claim 1, are neither shown in nor suggested by Sudo in view of Dent and Hoang et al., and further in view of van der Gracht et al. Therefore, the Appellants respectfully submit that claims 4-5 are allowable over Sudo in view of Dent and Hoang et al., and further in view of van der Gracht et al.

D. Rejection of claim 6 under 35 U.S.C. §103(a) over Sudo, Dent and Hoang et al., and further in view of Balachandran et al.

As discussed previously herein, the Appellants' claimed invention as recited in independent claim 1 is neither disclosed in nor suggested by Sudo alone or in combination with Dent and Hoang et al. The Balachandran et al. reference, which is cited for its disclosure of spreading an information signal by multiplying each bit of the information signal with the corresponding bit of a spreading code, does not cure the deficiencies of Sudo, Dent and Hoang et al. in failing to disclose or suggest the Appellants' invention as recited in claim 1. Accordingly, the Appellants respectfully submit that Balachandran et al. in combination with Sudo, Dent and Hoang et al., does not disclose or suggest the Appellants' invention as recited in claim 1.

Claim 6 depends directly from claim 1 and incorporates all of the features of claim 1. Furthermore, claim 6 includes other features that, when combined with the subject matter of claim 1, are neither shown in nor suggested by Sudo, Dent and Hoang et al., and further in view of Balachandran et al. For at least these reasons, the

Appellants respectfully submit that claim 6 is allowable over Sudo, Dent and Hoang et al., and further in view of Balachandran et al.

E. Rejection of claims 11-12 under 35 U.S.C. §103(a) over Sudo, further in view of Dent and Ahn et al.

The Appellants' claimed invention in independent claim 11 recites an apparatus that performs the transmission invention as discussed hereinabove with respect to the Appellants' claims 1-6. As discussed hereinabove, nothing in Sudo alone or combined with Dent discloses or suggests an information signal transmission apparatus that allocates the coded signals corresponding to the same bits of the spreading code to a respective one of a corresponding plurality of transmission channels, wherein the same bits from each of the coded signals allocated to a given transmission channel are summed using a corresponding analog summer, and wherein, in each transmission channel, the output of the corresponding analog summer is used as a modulation input to an optical transmitter.

The Appellants' invention as recited in claims 11 and 12 includes a signal allocator for allocating coded signals corresponding to the same bit of the spreading codes to a respective one of the transmission channels and, in each transmission channel, an analog summer with an output connected to the modulation input of a transmitter. Each analog summer sums respective bits from each of the spread spectrum encoded information signals, i.e., the first analog summer sums the first bits from each of the spread spectrum encoded information signals, the second analog summer sums the second bits from each of the spread spectrum encoded information

signals bits, and so on. For example, see the Appellants' Fig. 2. For at least the reasons discussed hereinabove, nothing in Sudo alone or combined with Dent discloses or suggests the Appellants' invention as recited in claims 11 and 12.

The Ahn et al. reference, which is cited for its disclosure of a WDM-CDMA transmitter, does not cure the deficiencies of Sudo and Dent in failing to disclose or suggest the Appellants' invention as recited in claims 11 and 12. Accordingly, the Appellants respectfully submit that the Ahn et al. reference in combination with Sudo and Dent does not disclose or suggest the Appellants' invention as recited in claims 11 and 12. Therefore, the Appellants respectfully submit that claims 11 and 12 are allowable over Sudo further in view of Dent and Ahn et al.

F. Rejection of claim 13 under 35 U.S.C. §103(a) over Sudo, Dent and Ahn et al., and further in view of Shattil.

As discussed previously, the Appellants' claimed invention as recited in independent claim 11 is neither disclosed in nor suggested by Sudo in view of Dent and Ahn et al. Shattil, which is cited for its disclosure of the use of quasi-orthogonal spreading codes, does not cure the deficiencies of Sudo, Dent and Ahn et al. in failing to disclose or suggest the Appellants' invention as recited in claim 11. Accordingly, the Appellants respectfully submit that Shattil in combination with Sudo, Dent and Ahn et al. does not disclose or suggest the Appellants' invention as recited in claim 11.

Claim 13 depends directly from independent claim 11, and incorporates all of the features of claim 11. Furthermore, claim 13 includes other features that, when combined with the subject matter of claim 11, are neither shown in nor suggested by

Sudo, Dent, and Ahn et al., and further in view of Shattil. For at least these reasons, the Appellants respectfully submit that claim 13 is patentable over Sudo, Dent, and Ahn et al., and further in view of Shattil.

G. Rejection of claims 14-16 under 35 U.S.C. §103(a) over Sudo, Dent and Ahn et al., and further in view of Way.

As discussed previously herein, the Appellants' claimed invention as recited in claim 11 is neither disclosed in nor suggested by Sudo in view of Dent and Ahn et al. The Way reference, which is cited for its disclosure of an optical transmitter, does not cure the deficiencies of Sudo, Dent and Ahn et al. in failing to disclose or suggest the Appellants' invention as recited in claim 11. Accordingly, the Appellants respectfully submit that the Way reference in combination with Sudo, Dent and Ahn et al., does not disclose or suggest the Appellants' invention as recited in claim 11.

Claims 14-16 depend directly or indirectly from independent claim 11, and incorporate all of the features of claim 11. Furthermore, claims 14-16 include other features that, when combined with the subject matter of claim 11, are neither shown in nor suggested by Sudo, Dent and Ahn et al., and further in view of the Way reference. For at least these reasons, the Appellants respectfully request that claims 14-16 are allowable over Sudo, Dent and Ahn et al., and further in view of the Way reference.

H. Rejection of claims 17-18 under 35 U.S.C. §103(a) over Sudo, Dent and Ahn et al., and further in view of van der Gracht et al.

As discussed previously herein, the Appellants' claimed invention as recited in independent claim 11 is neither disclosed in nor suggested by Sudo in view of Dent and Ahn et al. The van der Gracht et al. reference, which is cited for its disclosure of the use of data spreading using exclusive-NORing, does not cure the deficiencies of Sudo, Dent and Ahn et al. in failing to disclose or suggest the Appellants' invention as recited in claim 11. Accordingly, the Appellants respectfully submit that the van der Gracht et al. reference in combination with Sudo, Dent and Ahn et al., does not disclose or suggest the Appellants' invention as recited in claim 11.

Claims 17 and 18 depend directly from claim 11, and incorporate all of the features of claim 11. Furthermore, claims 17 and 18 include other features that, when combined with the subject matter of claim 11, are neither shown in nor suggested by Sudo, Dent and Ahn et al., and further in view of van der Gracht et al. For at least these reasons, the Appellants respectfully submit that claims 17 and 18 are allowable over Sudo, Dent and Ahn et al., and further in view of van der Gracht et al.

I. Rejection of claim 19 under 35 U.S.C. §103(a) over Sudo, Dent and Ahn et al., and further in view of Balachandran et al.

As discussed previously herein, the Appellants' claimed invention as recited in independent claim 11 is neither disclosed in nor suggested by Sudo alone or in combination with Dent and Ahn et al. The Balachandran et al. reference, which is cited for its disclosure of spreading an information signal by multiplying each bit of the

information signal with the corresponding bit of a spreading code, does not cure the deficiencies of Sudo, Dent and Ahn et al. in failing to disclose or suggest the Appellants' invention as recited in claim 11. Accordingly, the Appellants respectfully submit that the Balachandran et al. reference in combination with Sudo, Dent and Ahn et al., does not disclose or suggest the Appellants' invention as recited in claim 11.

Claim 19 depends directly from claim 11 and incorporates all of the features of claim 11. Furthermore, claim 19 includes other features that, when combined with the subject matter of claim 11, are neither shown in nor suggested by Sudo, Dent and Ahn et al., and further in view of Balachandran et al. For at least these reasons, the Appellants respectfully submit that claim 19 is allowable over Sudo, Dent and Ahn et al., and further in view of Balachandran et al.

CONCLUSION

Based on the foregoing discussion, the Appellants respectfully request that the Examiner's final rejection of claims 1-6 and 11-19 be overruled and withdrawn by the Board and that the application be allowed to issue as a patent with pending claims 1-6 and 11-19.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

1. (Previously presented) A wavelength division multiplexing (WDM) method for transmitting information signals via multiple transmission channels, the method comprising:

encoding each information signal with a respective spreading code to generate a coded signal corresponding to each bit of the spreading code, the spreading codes being mutually different;

allocating the coded signals corresponding to the same bit of the spreading codes to a respective one of the transmission channels; and

in each of the transmission channels:

analog summing the coded signals allocated thereto to generate a modulation signal, and

generating an optical transmission signal in response to the modulation signal.

2. (Original) The method of claim 1, in which the spreading codes are mutually orthogonal.

3. (Original) The method of claim 1, in which the spreading codes are mutually quasi-orthogonal.

4. (Original) The method of claim 1, in which the encoding comprises multiplying the information signal by each bit of the respective spreading code to generate the corresponding coded signal.

5. (Original) The method of claim 4, in which the multiplying comprises exclusively-NORing the information signal with the bit of the respective spreading code.

6. (Original) The method of claim 1, in which:

each spreading code comprises bits each in one of a first state and a second state; and

the encoding comprises:

for each bit of the spreading code in the first state, outputting the information signal as the coded signal corresponding to the bit of the spreading code, and

for each bit of the spreading code in the second state, inverting the information signal and outputting the inverted information signal as the coded signal corresponding to the bit of the spreading code.

7. (Withdrawn) A method for recovering information signals from channel signals received via respective transmission channels, the channel signals resulting from encoding the information signals with respective spreading codes, the method comprising, for each of the information signals:

multiplying the channel signal from each of the transmission channels by a respective bit of the spreading code assigned to the information signal to generate a respective product signal;

analog summing the product signals to generate a sum signal; and

subjecting the sum signal to thresholding to recover the information signal.

8. (Withdrawn) The method of claim 7, in which the spreading codes assigned to the information signals are mutually orthogonal.

9. (Withdrawn) The method of claim 7, in which the spreading codes assigned to the information signals are mutually quasi-orthogonal.

10. (Withdrawn) The method of claim 7, in which:

each spreading code comprises bits each in one of a first state and a second state; and

the multiplying comprises:

for each bit of the spreading code in the first state, outputting the channel signal as the respective product signal, and

for each bit of the spreading code in the second state, inverting the channel signal and outputting the inverted channel signal as the respective product signal.

11. (Previously presented) A wavelength division multiplexing (WDM) apparatus for transmitting information signals via multiple transmission channels, the apparatus comprising:

for each of the information signals, a spread-spectrum encoder comprising coded signal outputs and operable to encode the information signal with a respective spreading code to provide a coded signal corresponding to each bit of the spreading code at a respective one of the coded signal outputs, the spreading codes being mutually different;

a signal allocator connected to the coded signal outputs of the spread-spectrum encoders, the signal allocator structured to allocate the coded signals corresponding to the same bit of the spreading codes to a respective one of the transmission channels; and

in each of the transmission channels:

an analog summer comprising an output, and inputs connected to the signal allocator to receive therefrom the coded signals allocated to the transmission channel, and

a transmitter comprising a modulation input connected to the output of the analog summer.

12. (Original) The apparatus of claim 11, in which the spreading codes are mutually orthogonal.

13. (Original) The apparatus of claim 11, in which the spreading codes are mutually quasi-orthogonal.

14. (Original) The apparatus of claim 11, in which:

the transmitter additionally comprises an output; and

the apparatus additionally comprises a multiplexer comprising inputs connected to the outputs of the transmitters, and an output coupled to a transmission medium.

15. (Original) The apparatus of claim 11, in which the transmitters are optical transmitters and the transmission medium comprises an optical fiber.

16. (Original) The apparatus of claim 15, in which the transmitters are wireless transmitters.

17. (Original) The apparatus of claim 11, in which the spread-spectrum encoder comprises:

a spreading code source comprising outputs each providing a respective bit of the spreading code; and

for each bit of the spreading code, a multiplier comprising an input connected to receive the information signal, an input connected to a respective one of the outputs of the spreading code source, and an output that provides a respective one of the coded signals.

18. (Original) The apparatus of claim 11, in which the spread-spectrum encoder comprises:

a spreading code source comprising outputs each providing a respective bit of the spreading code; and

for each bit of the spreading code, an exclusive-NOR gate comprising an input connected to receive the information signal, an input connected to a respective one of the outputs of the spreading code source, and an output that provides a respective one of the coded signals.

19. (Original) The apparatus of claim 11, in which:

each spreading code comprises bits each in one of a first state and a second state; and

the spread-spectrum encoder comprises:

for each bit of the spreading code, an information signal input, a coded signal output and a signal path interconnecting the information signal input and the coded signal output, and

for each bit of the spreading code in the second state, an inverter in series with the signal path.

20. (Withdrawn) Apparatus for recovering information signals from channel signals received via respective transmission channels, the channel signals resulting from encoding the information signals with respective spreading codes, the apparatus comprising a spread-spectrum decoder for each information signal, the spread-spectrum decoder comprising:

multiplying means, connected to receive the channel signals from the transmission channels, for multiplying each channel signal by a respective bit of the spreading code assigned to the information signal to generate a respective product signal; and

an analog summer comprising an output, and inputs connected to receive the product signals from the multiplying means; and

a threshold circuit comprising an input connected to the output of the analog summer and additionally comprising an output providing the information signal.

21. (Withdrawn) The apparatus of claim 20, in which the spreading codes are mutually orthogonal.

22. (Withdrawn) The apparatus of claim 20, in which the spreading codes are mutually quasi-orthogonal.

23. (Withdrawn) The apparatus of claim 20, in which:

the spread-spectrum decoder additionally comprises a spreading code source comprising outputs each providing a respective bit of the spreading code; and

the multiplying means comprises a multiplier for each of the transmission channels, the multiplier comprising an input connected to receive the channel signal from the transmission channel, an input connected to a respective one of the outputs of the spreading code source, and an output that provides a respective one of the product signals.

24. (Withdrawn) The apparatus of claim 20, in which:

each spreading code comprises bits each in one of a first state and a second state; and

the multiplying means comprises:

for each bit of the spreading code, a channel signal input connected to receive the channel signal from the transmission channel, a product signal output that provides a respective one of the product signals, and a signal path interconnecting the channel signal input and the product signal output, and

for each bit of the spreading code in the second state, an inverter in series with the signal path.

25. (Withdrawn) The apparatus of claim 20, additionally comprising:

an optical receiver in each of the transmission channels, the optical receiver operable to derive the channel signal for the transmission channel from a single-wavelength optical signal; and

a channel signal distributor connected between the optical receivers and the spread-spectrum decoders.

EVIDENCE APPENDIX

The Appellants have submitted no evidence in support of the arguments presented on appeal pursuant to 37 C.F.R. §§1.130, 1.131 or 1.132, and there is no evidence entered by the Examiner and relied upon by Appellants in the pending appeal.

RELATED PROCEEDINGS APPENDIX

The Appellants are not aware of any proceedings related to this appeal.